

Right gland load crucial for fugitive emission sealing

A variety of gland packing sets are available for fugitive emission stem sealing of valves. These sets are entirely capable of meeting current and future regulations. However, to ensure the proper functioning of the sealing set, the right installation is crucial. Most importantly, the application of the gland load is essential to guarantee trouble-free service from the valve.

By Ralf Vogel

About the author

Ralf Vogel is a mechanical engineer and has been working in the sealing industry for 26 years. Currently, he is the Technical Director of the European Sealing Association. His main experience is in the development of packings and gaskets for various applications including fugitive emission solutions.



To achieve a proper seal an initial higher gland load is necessary to fully seat the packing set in the stuffing box and to make sure that all packing rings are in contact with the stem and housing.

After a short holding time to allow for the plastic deformation of the packing set, the gland can be loosened, and the spindle moved a few times. Then the service load can be applied which is necessary to provide a tight seal without excessive friction between packing set and stem (Figure 1).

The sealing performance can be further enhanced when the packing rings in the set are compressed individually instead of compressing the entire set after installation. This might be particularly helpful when endless expanded graphite rings with higher densities are installed.

Compromised performance

To ensure that the right gland load is applied, either the amount of compression on the packing set can be measured, or a specific gland load can be applied with a torque wrench.

To achieve low emission levels, the packing manufacturer provides the correct gland load for a given packing or packing set, depending on the application parameters including pressure, temperature, and number of cycles. However, in case of older valves the question is always if the torque on the gland bolts is transferred sufficiently onto the packing set. If not, the performance of the sealing set is compromised. Therefore, it is important to check the following points:

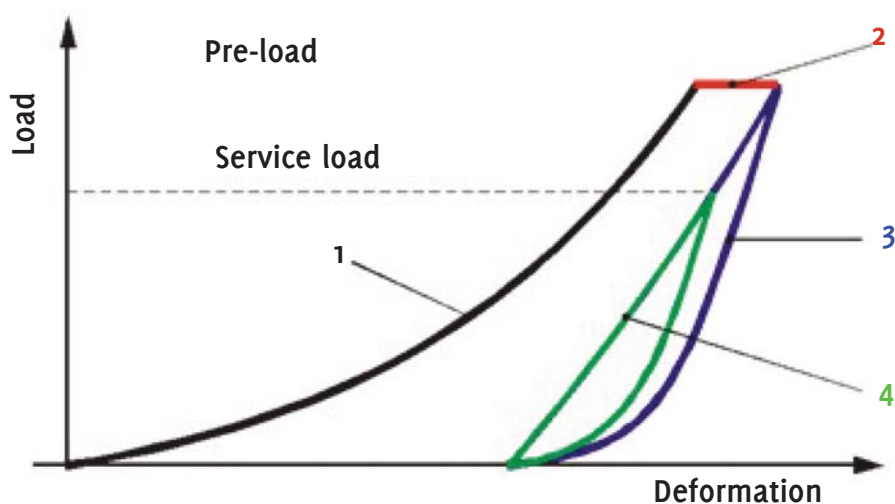
1. Are the gland bolts and nuts in good condition? They should be straight and without corrosion. If corroded or damaged the bolts

must be replaced. The same applies to the nuts. They should turn freely along the bolt. Extra lubrication during installation helps to minimize thread friction.

2. The gland should be checked to make sure it is not bent. Hardened washers under the gland nuts prevent galling of the nuts and gland.
3. The gland should be clean and free from paint or corrosion. The gland should move freely in the stuffing box housing without resistance.
4. There should still be enough room between the gland and the valve housing after installation to allow for re-torquing.
5. Is the stem free of corrosion and surface imperfections? Is it moving freely and straight?
6. The clearances between gland and stem/housing should not be too tight or too large. When too tight, direct contact can occur. When the clearance is too large, packing extrusion can reduce the gland stress during operation significantly.

Live-loading

A good way to guarantee a steady gland load over the lifetime or service life of the valve is to add spring loading of the gland



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| 1 Pre-load (Seating, filling of gaps) | 2 Holding time (Plastic deformation) |
| 3 Reproducible line | 4 Service load |

Fig. 1: Load-deformation diagram for packing set (Source: Co. Amtec)

bolts. This method, known as live-loading, is especially important for frequently operated valves or for valves submitted to high temperature cycling.

It also makes sense for valves which are not easily accessible when installed in the plant. In addition, special systems are available to help to protect the spring

discs and to provide a visual check of the compression set (Figure 2).

Packing manufacturers will help by supplying a tailored solution that is based on the application parameters. But also, dimensional information about bolt size, length and free space between stem and bolt must be provided to design a system which will fit onto the valve.

As stated, a good sealing performance is not only achieved by selecting a low emission packing set. The whole sealing system in the valve, including stuffing box, stem, gland and gland bolts must be in proper condition. Also, the correct installation and running-in of the packing set is important. If everything is done with the right care, a low emission and safe performance of the valve can be guaranteed.



Fig. 2: Disc Spring loaded bolt with housing (Source: Co. EagleBurgmann)

Fugitive emission sealing has become more important due to tightening regulations and subsequent requirements for end users. Upcoming legislation such as the revised TA-Luft in Germany or the planned stricter methane emissions initiative of the EU are examples. Modern fugitive emission packings and packings sets are well capable to meet current and future legislation requirements. Packings tested according to API 622 or ISO 15848-1 in a valve guarantee a low emission performance. For refurbished valves it is important that the condition of the valve is in order and that corroded or damaged parts have been replaced. The other factor for a good emission performance is the installation of the packing set. Here the application of the correct gland compression is crucial.